Question #1: Fine Arts

10 points

A 10-minute symphonic poem by this composer begins with four sharps in the key signature and ends with five flats, but never really settles into a key. That work is based on a poem by Stéphane Mallarmé [steh-fahn mah-lar-may]. A four-part piano suite by this composer, inspired by the poetry of Paul Verlaine, has a famous third part that is often performed separately. This composer of *Suite bergamasque* also wrote a set of three symphonic sketches for orchestra, the second of which is "Play of the Waves". Name this French composer of *Prelude to the Afternoon of a Faun*, *La mer*, and "Clair de lune".	(Achille-)Claude **Debussy**

Question #2: Social Studies

10 points

In 1919, the people of this country tried to unify it by signing the Act Zluky [ZLOO-kih]. This country also unsuccessfully tried to gain independence under Andriy Melnyk [AHN-dree MEL-nik] and Stepan Bandera. When this country gained independence, Leonid Kravchuk became its president. Massive fraud was alleged in this country's 2004 election, leading to the Orange Revolution. One of the Orange Revolution leaders, Yulia Tymoshenko [YOO-lee-uh ti-moh-SHAYN-koh], became this country's prime minister and was the target of a smear campaign by Paul Manafort. Name this former Soviet republic that lost territory in 2014 due to the Russian annexation of Crimea.	**Ukraine** [or **Ukrayina**]

Question #3: Science

10 points

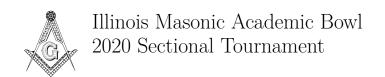|	
The "double" version of this phenomenon takes place in birefringent ["by"-ree-"FRINGE"-ent] materials and was explained by Augustin-Jean Fresnel [oh-goo-stan zhahn fruh-nel] using polarization. This phenomenon happens according to Fermat's [fear-mah'z] principle, which is also called the principle of least time. Beyond the critical angle, total internal reflection occurs instead of this phenomenon. Snell's law quantifies this phenomenon by giving an angle. Dividing the speed of light in a vacuum by the speed of light in a material gives the "index of" this phenomenon. Name this phenomenon in which light bends when it travels from one medium to another.	**refract**ion [accept **refract**ing; do not accept "diffract(ion)"]

Question #4: Literature

10 points

In a letter that is now considered a poem, this person wrote "I labor to be concise; I become obscure." That poem, which compares painters and poets, was written by this person to the Piso [PEE-soh] family. This person's poem addressed to Lucinius Murena [loo-SIN-ee-uss moo-RAY-nuh] says "Whosoever loves the golden mean, is secure from the sordidness of an antiquated cell." John Dryden paraphrased this poet by writing "Tomorrow, do thy worst, for I have lived today." Those words come from this writer's four book of odes, which precede his book of epodes [EP-"odes"]. Name this ancient Roman poet who wrote the *Ars Poetica* and the words "Seize the day."	**Horace** [or Quintus **Horatius** Flaccus]

Question #5: Social Studies

10 points

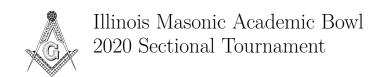| The power of Congress to establish buildings for this agency is given in the only clause of the Constitution to mention roads. In reaction to a 1970 strike, this government function was converted from a Cabinet-level department to a corporation-like independent agency. An early version of this agency was created by the Second Continental Congress and overseen by Benjamin Franklin. The objects handled by this agency are labelled "retail ground", "periodicals", "marketing", "first-class", "priority", and "priority express". Name this federal agency that is theoretically a monopoly but practically competes with UPS and FedEx.	US **Postal Service** or US**PS** [or the United States **Post Office**; accept US **Mail**]

Question #6: Science

10 points

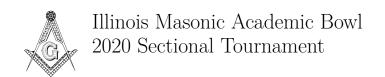| Sago ["SAY-go"] and sweeteners are added to this food to make taho [tah-HOH]. This food is cut into thin slices to make abura-age [ah-BUR-uh AH-gay], and it forms the pouch of inarizushi [ee-nah-ree-zoo-shee]. A very soft form of this food is a type of pudding called douhua [DOO-wah]. The production of this food, which involves adding calcium and magnesium chlorides and sulfates as coagulants, also creates okara [oh-KAH-ruh]. Some parts of the process for making this food are similar to cheese production, though this food is vegan. This food is high in iron and protein. Name this food, originally from China, that is produced from coagulated soy milk and is sometimes called "bean curds".	**tofu** [prompt on **bean curd**s before the end; prompt on **soy**beans before "soy"]

Question #7: Mathematics

10 points per part

	Monte Carlo methods use this concept to simulate complicated processes.	
1	Name this concept in which numbers are unpredictable rather than forming patterns.	**random**ness [or **random** numbers; accept **stochastic**ness or pseudo**random**ness]
2	A popular pseudo·random number generator is called the "twister" named after these prime numbers.	**Mersenne** primes [accept **Mersenne** twister]
3	Find the third Mersenne prime. In other words, find the third-smallest prime number that is 1 less than a power of 2.	**31**

Question #8: Mathematics

10 points per part

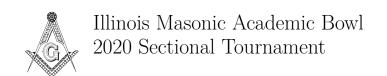|	This distribution is a specific bell-shaped curve.	
1	Name this specific distribution which has a mean of 0 and a standard deviation of 1. Your answer should have two adjectives.	**standard normal** distribution [accept **standard Gaussian** distribution; prompt on partial answers]
2	The probability density function for the standard normal distribution contains the expression "e to the minus one-half x raised to a power". What power is x raised to?	**2** or **second** power or **square**d
3	Rounded to the nearest hundredth, give the integral of the probability density function of the standard normal distribution between x equals -1 and x equals 1.	0.**68**

Question #9: Literature

10 points per part

	This kingdom is between Archenland and Ettinsmoor.	
1	Name this land created by Aslan the lion, who crowns the Pevensie [PEV-en-see] children.	**Narnia**
2	This author wrote *The Chronicles of Narnia*, including *The Lion, the Witch and the Wardrobe*.	C(live) S(taples) **Lewis**
3	This is the youngest Pevensie child. She is called "the Valiant" when she becomes a queen, and she heals Trumpkin.	**Lucy** Pevensie

Question #10: Literature

10 points per part

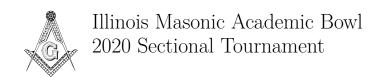|	This poem states "Old age should burn and rave at close of day."	
1	Name this poem which closes each stanza with its title or the line "Rage, rage against the dying of the light."	"**Do not go gentle into that good night**" [must be exact]
2	In the last stanza of the poem, what adjective does the poet use to describe his father's tears?	"**fierce**"
3	This Welsh poet wrote "Do not go gentle into that good night". He also wrote "And death shall have no dominion".	Dylan (Marlais) **Thomas**

Question #11: Social Studies

10 points per part

	Much of the White House was burned down during this war.	
1	Name this war, sometimes called "Mr. Madison's War", that was a stalemate between the U.S. and the U.K.	War of **1812**
2	This U.S. ship defeated five British ships during the War of 1812. After its victory over the HMS *Guerriere* [gair-yair], this ship got the nickname "Old Ironsides".	USS ***Constitution***
3	When this commodore was successful at the Battle of Lake Erie, he sent a message to William Henry Harrison stating "We have met the enemy and they are ours."	Oliver Hazard **Perry**

Question #12: Social Studies

10 points per part

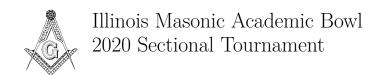|	Answer the following about the beginning of Barack Obama's presidency:	
1	As part of the stimulus, each person on this program received an extra 250 dollars. This program is formally called Old-Age, Survivors, and Disability Insurance, and it gives people retirement benefits.	**Social Security**
2	This person served as President Obama's first chief of staff. He later became the mayor of Chicago.	Rahm (Israel) **Emanuel**
3	President Obama signed an executive order stating that this detention facility on the island of Cuba should be shut down, but it was never shut down.	**Guantanamo** Bay Detention Camp [accept **GITMO**]

Question #13: Science

10 points per part

	Dmitri Mendeleev predicted properties of this element, calling it "eka·manganese" [EK-uh-MAN-guh-neez].	
1	Identify this element whose name reflects the fact that most production of it is artificial, even though its atomic number is much lower than other elements with that property.	**technetium** [accept **Tc**]
2	Technetium was discovered using this type of particle accelerator that uses a spiral-shaped path and was invented by Ernest Lawrence.	**cyclotron**
3	Technetium was discovered in a sample that was primarily this metal. It and chromium are often added to stainless steel to prevent corrosion.	**molybdenum** [muh-LIB-deh-num] [accept **Mo**]

Question #14: Science

10 points per part

	This phenomenon can be seen in oxygen because di·atomic oxygen and ozone are different compounds.	
1	Name this phenomenon in which a single element makes more than one compound.	**allotropy** [AL-oh-troh-pee] [or **allotrope**s or **allotropism**]
2	This element, the most common element in semiconductors, can exist as a crystal or amorphous solid.	**silicon** [accept **Si**]
3	This element has some alloys that expand when they solidify. This element also has an explosive allotrope that changes and releases heat when it is scratched.	**antimony** [AN-tih-moh-nee] [accept **Sb**]

Question #15: Literature

10 points

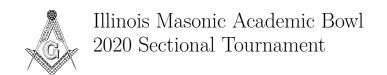|	
Some words that are this part of speech are classified as "collateral" when they are closely associated with a word of a different part of speech but are not similar to the other word. Though this part of speech is not a noun, it often is the same word as a demonym [DEH-moe-nim] used to represent a place. Determiners have been classified as either pronouns or this part of speech, though some linguists make a new classification for them, so there is disagreement as to whether articles are this part of speech. An adverb modifies a verb, another adverb, or this part of speech. Name this part of speech that is used to describe a noun.	**adjective**s [or **adjectival**]

Question #16: Mathematics

10 points

The theorem named for this concept states that if f is a smooth function whose derivative at some point a is not 0, then this concept can be applied to f around a, and the result of this concept is based on the reciprocal of the derivative. If this concept is applied to a function twice, the result is the original function. The "arc" trig functions are the result of applying this concept to the trig functions, and logarithmic functions are the result of applying this concept to exponential functions. This concept is denoted with a superscript "-1". Name this concept of "undoing" a function.	**inverse** functions or function **inverse**s or **inverse**s of a function or **inversion** or **invert**ing

Question #17: Social Studies

10 points

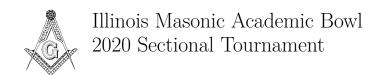|	
This U.S. President appointed George Mitchell to be U.S. Special Envoy for Northern Ireland, and Mitchell headed the talks that created the Good Friday Agreement. This president's secretary of state, Warren Christopher, helped negotiate the Dayton Agreement to end the Bosnian War, though this president later authorized bombings in the Kosovo War. This president was the subject of the Starr Report, which described his relationship with Monica Lewinsky and was used to justify his impeachment. Name this president from 1993 to 2001.	(William Jefferson) "Bill" **Clinton** [or William Jefferson **Blythe** III]

Question #18: Science

10 points

This process is the primary way that vitamin B_{12} and mono·sodium glutamate [GLOO-tuh-"mate"] are produced. Genetic modification is made to some organisms so that they use this process to create chymosin [ky-MOH-sin], which is used in rennet to make cheese. Though humans primarily use other processes, this process occurs in the digestive tract to produce butyrate [BYOO-tuh-"rate"], and in muscles resulting in lactic acid waste. This process happens to some of the flour when bread is made, causing the bread to rise. Louis Pasteur [loo-ee past-er] studied this process in yeasts. Name this an·aerobic extraction of energy from carbohydrates.	**ferment**ation or **ferment**ing or being **ferment**ed [accept **anaerobic** (cellular) **respiration**]

Question #19: Miscellaneous

10 points

Early seasons of this TV show feature Leslie Winkle, who got upset when the main character signed up for the Buckman 204 mainframe. One character in this show lives with his mom, whose face is never shown and who is often heard yelling at him. That character goes to the International Space Station and in later seasons marries Bernadette Rostenkowski, a microbiologist. The main character in this show is very protective of his spot on the couch, and in the last episode he and his wife Amy share the Nobel Prize in Physics. Name this TV series set at Caltech, on which Jim Parsons played Sheldon Cooper.	*The* **_Big Bang Theory_**

Question #20: Literature

10 points

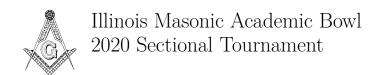|	
In a short story by this writer, Jerrodette I tells her daddy, "Don't let the stars run down." Her daddy later reads "Insufficient data for a meaningful answer" in one of this writer's stories involving the Multivac. This author of "The Last Question" set another story in a place where everybody goes insane every 2,000 years. That place is the planet Lagash, which has six suns. In addition to "Nightfall", this author wrote a story in which Andrew Martin wants surgery performed by a robot. That story, "The Bicentennial Man", hinges on this writer's First Law of Robotics. Name this science fiction writer whose Three Laws of Robotics are in his collection *I, Robot.*	Isaac **Asimov** [or Isaak Yudovich **Ozimov**]

Question #21: Social Studies

10 points per part

	One of these "signs producing grace" is Holy Orders, which makes a person a bishop, priest, or deacon.	
1	Give the collective name of these seven rites in the Catholic Church, starting with baptism.	seven **sacrament**s
2	For American Catholics, this sacrament usually occurs anywhere from the age of 7 to 16 years. This sacrament strengthens membership in the Church.	**Confirmation** [or **Chrismation**]
3	One of the current sacraments is the anointing of the sick. That sacrament used to be called by this two-word name, especially when performed on people who were dying.	**Extreme Unction** [prompt on **last rites**]

Question #22: Social Studies

10 points per part

	Some translations of First Corinthians refer to "faith, hope, and love", while other translations refer to "faith, hope, and" *this* concept.	
1	Name this concept common in many religions. Jews call it tsedakah and Muslims call it *zakat.*	**charity** [accept **charitable** giving or **donation**s; do not accept or mention "tithing" or "tithe"]
2	This term refers to the practice supported by several religions of giving one-tenth of a person's income to charity.	**tithing** or **tithe**(s)
3	Some charities in India support these buildings near temples that provide rooms and sometimes food.	**choultry** or **chatra**m or **satra**m or **dharmasala**

Question #23: Fine Arts

10 points per part

	This artist depicted a swirling sky in *The Starry Night*.	
1	Name this artist who sometimes depicted himself bandaged after he mutilated one of his ears.	Vincent (Wilem) **van Gogh**
2	This Vincent van Gogh painting shows a man in white standing next to a pool table in an eating establishment.	*The **Night Café*** [or *Le **Café de nuit***]
3	*The Night Café* is set in Arles [arl], where van Gogh also painted a starry night over this river.	**Rhône** River [do not accept "Rhine"]

Question #24: Fine Arts

10 points per part

	This painting was originally titled *The Bath*, since it shows a woman in a stream in the background.	
1	Name this 1863 painting whose foreground shows two dressed men having a picnic with a naked woman.	*The **Luncheon on the Grass*** [or *Le **Déjeuner sur l'herbe***]
2	*The Luncheon on the Grass* is by this French painter. He depicted a woman on a bed being brought flowers by a servant in *Olympia*.	Édouard **Manet** [ayd-war man-ay] [do not accept "Monet"]
3	This Manet painting, named for its location, shows a man and a woman sitting next to each other on a bench in front of boats. They are both fully dressed and wearing hats, and the man is looking at the woman.	***Argenteuil*** [ar-zhen-twee]

Question #25: Science

10 points per part

	This equation takes into account the average rate of star formation in our galaxy and the fraction of those stars that have planets, among other factors.	
1	Name this equation that is supposed to approximate the number of civilizations that Earth could communicate with.	**Drake** equation
2	One factor in the Drake equation is based on whether planets are in a habitable zone. Such zones are given this name, based on a fairy tale.	**Goldilocks** zone
3	Sara Seager has modified the Drake equation to include signature atmosphere gases. Shawn Domagal-Goldman considers this gas to be the signature gas of life, but Seager encourages a more varied approach.	**oxygen** [accept **O_2**]

Question #26: Science

10 points per part

	This phenomenon explains why lunar orbital periods can often be expressed as ratios of small whole numbers.	
1	Name this regular influence of one body on another that causes orbits to be more stable.	orbital **resonance**
2	Dione ["die"-OH-nee], a moon of Saturn, is in a 1-to-2 resonance with this coldest moon of Saturn. It has a very high albedo [al-BEE-doh].	**Enceladus** [en-SELL-uh-duss]
3	An orbital resonance in the ratio 4 to 2 to 1 is named for this person.	Pierre-Simon **Laplace** [luh-plahss] [accept **Laplace** resonance; prompt on **Laplacian** resonance]

Question #27: Literature

10 points per part

	One of these creatures was Alcyoneus [al-"SIGH"-uh-nooss], who was taken from his homeland and killed by Heracles.	
1	Name these large creatures who were the offspring of Gaia ["GUY-uh"] and Uranus after the Titans, and who lost a major war to the Olympian gods.	**giants** [or **Gigante**s]
2	The giants were born after this Titan castrated Uranus.	**Cronus**
3	Much of our knowledge of Greek beliefs about giants comes from this person's compendium of myths, the *Bibliotheca* [bib-lee-oh-TEH-kuh].	Pseudo-**Apollodorus** [or **Apollodorus** of Athens]

Question #28: Literature

10 points per part

	These nine goddesses were the daughters of Zeus and Mnemosyne [neh-MAH-suh-nee].	
1	Name these goddesses that inspired people to write music and poetry.	**Muse**s
2	Name the Muse of History, who was often portrayed with books.	**Clio**
3	Clio was punished for criticizing Aphrodite [af-roh-"DIE"-tee] when Aphrodite fell in love with this mortal.	**Adonis** [uh-DAH-niss]

Question #29: Mathematics

10 points

2 raised to this power is the smallest power of 2 that is greater than 1 million. This number can combine to form a Pythagorean triple with 99 and 101, and it can also do so with 21 and 29. This is the number of vertices of a dodecahedron [doh-DEK-uh-HEE-drun]. A regular polygon with this many sides has internal angles that measure 162 degrees and central angles that measure 18 degrees. The Platonic solid with this many faces has triangular faces arranged so that each vertex of the solid is the vertex of five of the faces. That solid with this many faces is the Platonic solid with the most faces. Name this number of faces of an icosahedron ["eye"-KOH-suh-HEE-drun].	**20**

Question #30: Social Studies

10 points

This country established an alliance with the United Kingdom through the Burney Treaty and liberalized trade through the Bowring Treaty. In the late 19th and early 20th centuries, Prince Damrong Rajanubhab [RAH-juh-noo-bahb] developed this country's *monthon* [mahn-tahn] system of administration. That prince was the half-brother of King Chulalongkorn [choo-LAH-long-korn] and son of King Mongkut [MAHNG-koot] of this country's House of Chakri. Though this country sometimes lost territory to European powers, it was never colonized. Name this country ruled by several kings who were called Rama [RAH-muh] and which was historically called Siam.	(Kingdom of) **Thailand** or (Ratcha-anachak) **Thai** [accept **Siam** before the end]

15

Question #31: Science

10 points

This person's book *New System of Chemical Philosophy* states that when two elements form a compound, the ratios of the masses is the ratio of small numbers. For an ideal gas, the law named after this person is equivalent to Amagat's [ah-muh-GAHT'S] law. This person's law can be combined with Raoult's law to find total vapor pressure or the vapor pressure from a constituent. This person is the namesake of both a period of low sunspot count and a form of color blindness. Name this English chemist who developed the law of partial pressures and played a major role in developing atomic theory.	John **Dalton**

Question #32: Literature

10 points

This character says "So wise, so young, they say, do never live long," but when he is asked what he said, he says "Without characters, fame lives long." This character says those words to his nephew, who wants to know what happened to Rivers and Grey. In an opening monologue, this character refers to himself as "deformed, unfinished, sent before my time". This character begins that monologue "Now is the winter of our discontent." Name this title character in a William Shakespeare historical play who says "A horse! a horse! my kingdom for a horse!".	**Richard III** [or the Duke of **Gloucester**; prompt on **Richard**]

Extra Question #1: Fine Arts

10 points

This painting is set in the shadow of Mount Pani. The painter of this work stated that part of it was inspired by Camembert [kam-um-bair] cheese that sat outside on a hot day. The human face in this painting appears to have either a tongue or a snail coming out of its nose. The background of this painting shows the coast of Catalonia. The only tree in this painting seems cut off on top and has no leaves; it has a branch to the side which in turn has a small branch going up. A red circular object in the corner of this painting is covered by bugs. Name this surrealist painting showing melting clocks by Salvador Dalí.	*The* **_Persistence of Memory_** [or *La* **_persistencia de la memoria_**]

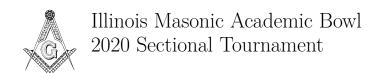## Extra Question #2: Mathematics

10 points

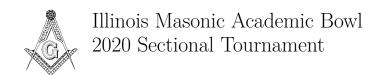| Pappus's area theorem uses extensions of sides from two of these shapes to create a third shape of this type whose area equals the sum of the first two areas. A shear mapping changes a rectangle into one of these shapes. A quadrilateral is one of these shapes if and only if its diagonals bisect each other. The area of one of these shapes equals the product of two adjacent sides times the sine of the angle between them. If all sides of this shape are congruent, then it is a rhombus. In this shape, any two adjacent angles are supplementary. Name this quadrilateral whose opposite sides are parallel.	**parallelogram**

Extra Question #3: Social Studies

10 points

Near the end of this person's presidency, Assistant U.S. Attorney General Jess Smith died, sparking a debate as to whether it was a suicide or murder. Smith was a member of the Ohio Gang, many of whom belonged to this president's cabinet. This person's cabinet, many of whom stayed on for his successor, also included Andrew Mellon and Herbert Hoover. Thomas Walsh investigated other members of this president's cabinet, including Harry Daugherty and Albert Fall, the latter of whom accepted bribes from oil companies. Name this president who died in office in 1923 and whose presidency was marred by the Teapot Dome scandal.	Warren G(amaliel) **Harding**

Extra Question #4: Science

10 points

When one example of this phenomenon moves north of the Himalayas each June, a separate example starts up that impacts the Indian Ocean and India until September. This phenomenon exists around the tropo·pause ["TROPE-oh-pause"], and it has polar and subtropical varieties in addition to that tropical easterly one. A temporary slowing of this phenomenon was blamed for recent heat waves in Europe, and its increasing wobbliness in recent years was blamed for polar vortex cold spells. Name this wind that is often over 100 miles per hour and surrounds the Earth in a meandering shape.	**jet** stream

Extra Question #5: Literature

10 points

This god used a threat to free Thanatos [THAN-uh-tohss] and cause Sisyphus [SISS-ih-fuss] to submit to Hades [HAY-deez]. When Athena wore the helmet of darkness, she helped Diomedes ["die"-oh-MEE-deez] throw his spear at this god's stomach, making this god scream in pain. Cadmus had to serve this god for eight years because this god was the protector of the dragon that Cadmus killed before founding Thebes [theebz]. This god was the father of Phobos [FOH-bohss] and Deimos ["DIE"-mohss]. Hephaestus [huh-FESS-tuss] used a net of gold to catch this god when he had an affair with Hephaestus's wife Aphrodite [af-roh-"DIE"-tee]. Name this Greek god of war.	**Ares** [prompt on **Mars**]

Extra Question #6: Science

10 points per part

	This process is often classified as divergent, convergent, or parallel.	
1	Name this process by which organisms develop through natural selection.	**evolution** or **evolving**
2	This term refers to species that are monophyletic [mah-noh-fy-LET-ik], meaning they have a common ancestor. There is an effort to make all organism classifications be these types of groups.	**clade**s [rhymes with "spades"]
3	One example of convergent evolution is that both these monotremes and porcupines have spiny skin, which they developed independently.	**echidna**s [**eh-KID-nuh**z]

Extra Question #7: Science

10 points per part

	Breathing is a major part of the aerobic version of this process.	
1	Name this process that moves oxygen to cells and carbon dioxide away from cells.	**respiration** [accept **respiring**]
2	Humans have about 300 million of these tiny air sacs in their lungs where gas exchange takes place.	(pulmonary) **alveoli** [al-vee-OH-"lie"] [or **alveolus**]
3	These surface epithelial [ep-ih-THEE-lee-ul] cells of the alveoli come in a type 1 that covers the surface and a type 2 whose lamellar bodies secrete a surfactant.	**pneumocyte**s [**NOO-moh-"site**s"]

Extra Question #8: Literature

10 points per part

	In this play, Hecuba [HEK-yoo-bah] states "There is no end to my sickness, no term. One disaster comes to vie with another."	
1	Name this ancient play in which Hecuba is one of the title characters and is upset at Helen.	*The **Trojan Women*** [or ***Troades***]
2	At the beginning of *The Trojan Women*, Poseidon and Athena are angry at the Greeks because of the treatment of this woman by Ajax the Lesser and Agamemnon [ag-uh-MEM-nahn]. This woman's prophecies are true but not believed.	**Cassandra**
3	This playwright wrote *The Trojan Women*. He also wrote *Iphigenia* [if-uh-jen-"EYE"-uh] *in Aulis* and *Iphigenia in Tauris*.	**Euripides** [yoo-RIP-uh-deez]

Extra Question #9: Literature

10 points per part

	This character's enemy was Gessler, who ruled Switzerland.	
1	Name this archer who, at Gessler's command, shot an apple off of his son's head.	**William Tell** [accept either; accept **Wilhelm** Tell or **Guillaume** Tell]
2	William Tell is the protagonist of a play by this author, who also wrote the poem "Ode to Joy", which is set to music in Beethoven's ninth symphony.	(Johann) Friedrich von **Schiller**
3	Friedrich von Schiller also wrote a trilogy about this general of the Thirty Years' War.	Albrecht von **Wallenstein** [VAHL-en-shteen] or **Waldstein** [VAHLD-shteen]